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Abstracts

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Theoretical Bases of Comparability Measures in Multi-Criteria Decision Making

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In most decision process there are alternatives that are incomparable. Until now there was no good theoretical approach to measure incomparabilities. The existing approaches use mostly heuristics, as, for example, Electre and Promethee methods. In this presentation a new three-step approach to measure incomparability is discussed. The first step is to establish a general preference model. The second is to collect all properties of the incomparability based on the preference structure. The third is to find a good representation consistent with the required properties. This approach is based on fuzzy theory. In the very early period of fuzzy research, the so-called fuzzy measure plays an important role. We propose to reconstruct the main idea of this measure and present its generalization. Further, to verify the incomparability measure, the Choquet integral is used.

Multicriteria Optimization Problems: Classification and Axiomatic Characterization

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The problem of multiple criteria optimization is to find minimizers of a vector valued function. Basic information about an MCO problem is provided by the feasible set and the objective function with its image space. The main difficulty of optimization in higher dimensional spaces is the absence of a canonical total order and therefore the definition of "optimality". Moreover, in practice it is often the case that decision makers have certain ideas concerning the properties of optimal solutions or the solution process of the MCOP. Therefore we propose to extend the definition of an MCOP to include these ideas. This can be done using a model map, mapping objective function values to an ordered set. In this ordered set outcomes are finally compared thus determining optimal solutions. Furthermore due to this approach we can derive a classification scheme for multiple criteria optimization problems comprising data (feasible set and objective function with its image space), model map, and ordered set. We define an MCO class to consist of all problems with the same model map and ordered set. Some classes defined in such a way are for example the Pareto, the lexicographic, and the max-ordering class of MCO. Regarding the above mentioned ideas of decision makers as axioms it is also (at least in some cases) possible to characterize the MCO classes which comply with these axioms. We will show that two axioms uniquely define the lexicographic max-ordering class.